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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/783,892	02/20/2004	Takahiro Ishikawa	789_125	7630

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EXAMINER	
THOMPSON, GREGORY D	

ART UNIT	PAPER NUMBER
2835	

DATE MAILED: 05/25/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

H'D

Office Action Summary	Application No.	Applicant(s)	
	10/783,892	ISHIKAWA ET AL.	
	Examiner	Art Unit	
	Gregory D. Thompson	2835	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on *16 February 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-11* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-11* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1, 2, and 9-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chiu et al. (US Patent 6,651,736 B2) in view of Bernier et al. (US Patent 6,069,023).

- Regarding claim 1, Chiu et al. disclose a heat spreader module, comprising: a base (80); a heat spreader member (60) joined on said base; and a substrate (50) arranged on said heat spreader member. While Chiu et al. does not explicitly say that the substrate is insulating it is an inherent property of a board in order to prevent the traces and components mounted on the board from shorting out. Microsoft Press Computer dictionary defines a circuit board as a flat piece of insulating material on which electrical components are mounted. Chiu et al. fails to disclose the specific material used for the base, however, as heat sinks are usually made of metal, it would have been obvious for the base (80) of Chiu et al. to be made of a copper alloy or any known material which would dissipate heat. Bernier et al. is relied upon to show further evidence of a heat spreader module (300), which include a copper alloy (column 12, lines 53-54). Although Bernier et al. does

not explicitly disclose the material properties of the copper alloy base, the properties of typical copper alloys are such their proof strength is above 45 Mpa, and coefficient of thermal conductivity above 270 W/m K (see Table 1, Properties and Selection: Nonferrous alloys and special purpose materials, Volume 2, ASM Handbook, and attached thermal conductivities of some sample copper alloys from the same volume). If the copper alloy base disclosed by Bernier et al. does not in fact have a proof strength higher than 45Mpa, and coefficient of thermal conductivity higher than 270 W/m K, then it would have been obvious to one of ordinary skill in the art to select a copper alloy with as high a proof stress and thermal conductivity as feasible, that will suit the application, cost and fabrication requirements, to improve the thermal performance and structural rigidity of the base. With regard to the recited heat treatment temperature and time of the base, the determination of patentability of the product is based on the product itself and does not depend on its method of production. It would have been obvious to one of ordinary skill in the art to use a copper alloy for the base of Chiu et al. due to the conventionality of using copper alloys for heat sinks as exemplified by Bernier et al. With respect to the temperature and time used to treat the alloy, barring any unexpected results, it would have been obvious to one of ordinary skill in the art to heat treat the alloy at the optimum time and temperature based upon

routine experimentation to determine the best thermal coefficient of conductivity.

- Regarding claim 2, Chiu et al. as modified by Bernier et al. disclose all the limitations of claim 1, but does not explicitly disclose the composition of the copper alloy base. At the time of the invention it would have been obvious to one of ordinary skill in the art to fabricate the base out of an alloy of Copper and 0.1-1.5 mass %Cr, or 0.1-0.5%Zr, or 0.05-0.3%Zr and 0.3-1.2%Cr, or 0.01-1.5%Ag, or 1.4-3.0%Fe, 0.05-0.2%Zn and 0.01-0.1%P, or alumina-dispersed copper, or any other known alloy of copper used for heat dissipation (Table 2, Properties and Selection: Nonferrous alloys and special purpose materials, Volume 2, ASM Handbook) based upon routine experimentation to determine the best copper alloy based upon thermal conducting efficiency, price, availability, ease of manufacturing, etc.
- Regarding claim 9, Chiu et al. as modified by Bernier et al. disclose all the limitations of claim 1, but does not explicitly disclose the thickness of the base. At the time of the invention, it would have been obvious to one of ordinary skill in the art to use a base with a thickness greater than or equal to 0.5mm and lower than or equal to 40% of the entire thickness of the heat spreader module, or any other thickness, based upon routine experimentation to determine the optimal thickness to

meet the heat transfer and structural rigidity goals, while staying within manufacturability and cost targets.

- Regarding claim 10, Chiu et al. further discloses an IC chip (40) arranged on said insulating substrate (50) with an electrode (42, 52) interposed between said IC chip and said insulating substrate.
- Regarding claim 11, Chiu et al. further discloses that the heat-releasing member (40) is joined under said heat spreader member (60).

3. Claim 7 rejected under 35 U.S.C. 103(a) as being unpatentable over Chiu et al. in view of Bernier et al., and further in view of Tobita (PGPub 2003/0003287). Chiu et al. as modified by Bernier et al. discloses all the limitations of claim 1, but does not disclose that the insulating substrate is one of AlN and Si3N4. Tobita et al. discloses an insulating substrate made of one of AlN and Si_3N_4 (paragraph 0005). At the time of the invention, it would have been obvious to one of ordinary skill in the art to incorporate the AlN or Si_3N_4 substrate taught by Tobita in the heat spreader module disclosed by Chiu et al. to make use of its low coefficient of thermal expansion.

4. Claims 3-6 rejected under 35 U.S.C. 103(a) as being unpatentable over Chiu et al. as modified Bernier at al. as applied to claim 1 above, and further in view of Ishikawa et al. (US Patent 6,110,577).

- Regarding claim 3, Chiu et al. as modified by Bernier et al. disclose all the limitations of claim 1, but do not disclose that heat spreader member comprises a composite material. Ishikawa et al. disclose a

heat spreader member (figure 2) comprising a composite material including carbon and one of copper and a copper alloy (abstract). At the time of the invention it would have been obvious to one of ordinary skill in the art to incorporate the composite heat spreader member as taught by Ishikawa et al. in the heat spreader module as disclosed by Chiu et al., to decrease the thermal expansion coefficient of the heat spreader member while retaining high thermal conductivity (Column 2, lines 30-40).

- Regarding claim 4, Ishikawa et al. further discloses that the composite material comprises a C base material impregnated with copper or a copper alloy (abstract).
- Regarding claim 5, Ishikawa et al. further disclose that the heat spreader member comprises a composite material including SiC and one of copper or copper alloy (abstract).
- Regarding claim 6, Ishikawa et al. further discloses that the composite material comprises an SiC base material impregnated with copper or a copper alloy.

5. Claim 8 rejected under 35 U.S.C. 103(a) as being unpatentable over Chiu et al. as modified by Bernier at al. as applied to claim 1 above, and further in view of Achari et al. (US Patent 5,863,493). Chiu et al. as modified by Bernier et al. disclose all the limitations of claim 1, but do not disclose that the base, heat spreader member and

substrate are joined with a hard solder with a melting temperature not less than 600°C. Achari et al. disclose a hard solder material with a melting temperature above 600°C (Table 1, number 3). At the time of the invention, it would have been obvious to one of ordinary skill in the art to replace the attachment medium used by Chiu et al. with the solder material taught by Achari et al. to increase the working range of temperatures for the heat spreader module.

6. Applicant's arguments filed 2/16/06 have been fully considered but they are not persuasive. Applicant's appear to argue that the base is joined to the spreader through hard soldering with respect to claim 1. However, no hard soldering material(s) claimed in claim 1. In the handle book ASM table 1 the properties of typical copper alloy are such their proof strength is above 45 Mpa and coefficient of thermal conductivity above 270 w/m. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to select a copper alloy with as high a proof stress and thermal conductivity as feasible that will suit cost and fabrication requirements to improve the thermal performance and structural rigidity of the base. With regard to the recited temperatures and time the language of "when" is intended use an barring any unexpected results or structural differences it would have been obvious to one of ordinary skill in the art at the time of the invention to heat treat the alloy at the optimum time and temperature based upon routine experimentation to determine the best thermal coefficient of conductivity (MPEP 2144.05(b)).

7. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gregory D. Thompson whose telephone number is (571) 272-2045. The examiner can normally be reached on M-Thr from 6:30AM to 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Lynn Feild can be reached on (571) 272-2800,ext. 35. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Gregory D Thompson
Primary Examiner
Art Unit 2835

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